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Abstract In developing economies, consumption of electricity in residential and commercial sectors increased with economic development. In order to identify the factors for effective facilitation of standard and labeling programs, this article explores factors that affect consumer choice to energy-efficient products. Main findings are as follows: (1)Consumers in Thailand shows the highest awareness to environmental friendly concepts, followed by India and China.(2) Chosen labeled products include air-conditioners, TVs, refrigerators and washing machines, but not some popular products such as ceiling fans, electric fans or mobile phones. (3) Consumer who has higher energy conservation perception will buy energy efficient products.(4) Consumers in China, India and Thailand are sensitive to energy efficiency of products, primarily because they lead to less expenditure on electricity. (5) Labeling works to make levels of the energy efficiency of products more visible and thus helped consumers to choose the products.

Keywords: Thailand, India, China, Labeling, Energy Efficiency Reference
JEL classification: Q41, L15, L68, D12

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Environmental Consciousness, Economic Gain and Consumer Choice of Energy Efficient Appliance in Thailand, China and India *

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Abstract

In developing economies, consumption of electricity in residential and commercial sectors increased with economic development. Further, in response to climate change and rising energy prices, the penetration of energy-efficient appliances has become a challenge for developing countries. Standard and labeling on the products are the programs that become popular in developing economies. In order to identify the factors for effective facilitation of the programs, this article explores factors that affect consumer choice to energy-efficient products. Consumer choice behavior was analyzed using extensive information from the Japan External Trade Organization's "Survey on Energy Conservation Awareness and Purchasing Behavior in Thailand, India and, China." Main findings are as follows: (1)Consumers in Thailand shows the highest awareness to environmental friendly concepts, followed by India and China.(2) Chosen labeled products include air-conditioners, TVs, refrigerators and washing machines, but not some popular products such as ceiling fans, electric fans or mobile phones. (3)Consumer who has higher energy conservation perception will buy energy efficient products.(4) Consumers in China, India and Thailand are sensitive to energy efficiency of products, primarily because they lead to less expenditure on electricity. (5) Labeling works to make levels of the energy efficiency of products more visible and thus helped consumers to choose the products.

Keywords: Energy Efficiency Labels and Standard, Thailand, India, China
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1 Introduction

As a part of greenhouse gas (GHG) reduction program, energy efficiency policy is now being promoted worldwide at a high pace. This follows the United Nations Framework Convention on Climate Change and the Kyoto Protocol. Since the 1990s, some programs to improve energy efficiency have been conducted in developing countries with support from the Global Environmental Facility and other donors (Birner and Martinot 2005). However, the International Energy Agency (IEA) still estimates that end-use efficiency will account for 38% of total emissions reduction by 2050 (IEA, 2010a). Energy security in climate change was raised as one of the main agenda items at the 31st G8 Summit at Gleneagles in 2005. Countries are accelerating development of energy efficiency policies for sustainable development (G8, 2005, UNECE, 2006, 2010, Sharker, A., Singh J., 2010).

In fact, the percentage of consumption of electricity in overall energy consumption has rapidly increased in recent 30 years among the world (IEA, 2010b). According to many recent studies, a key driver in the energy consumption by households in developing countries is the fact that people in these countries can now live a comfortable life, using new home electrical appliances such as heaters and air-conditioners (Gleneagles, 2005, Tukker, A., *et. al*, 2008). With the clarity of this situation, policies to promote sustainable consumption in developing countries have become increasingly important (Tukker, A.,*et.al*, 2008). In Asian countries, there is a tendency for new home electrical appliances to increase in order to satisfy household demand so that citizen can enjoy a more comfortable lifestyle in urbanization along with industrialization.

In this situation, many literatures claim that China, the top consuming country of energy in the world, needs to promote further energy efficiency measures. However, though Chinese government has been promoting such measures in both supply and demand of energy, but which is not sufficient. Many specific suggestions have been made such as introduction of standard on energy efficiency (Lu, W., 2006, 2007), applying economic measures, including energy taxes (Fan, Y., 2007 *et.al*); completing measurement methods of environmental impact assessments from the viewpoint of energy efficiency (Bian., Y., 2010), and emphasizing energy efficiency policies balanced with other energy measures such as renewable energy policies and the eco-city idea (Caprotti, 2009). India began to import energy in the 1990s, and its energy intensity is higher than that for other countries. Though

the use of fluorescent lamps have been recommended, further energy efficiency measures are needed (Balachandra, P., *et. al*, 2010). Thailand, also an importer of energy, has introduced energy efficiency policies by means of a demand management policy. Thailand was the first country to have introduced the policy in Asia, and it is promoting energy efficiency measures for lighting equipment (Sulyma, I., M., et. al., 2000).

For energy efficiency measures of home electrical appliances, the non-profit organization CLASP based in US advances the view that realization of a proper energy efficiency standard, eliminating non energy-efficient products from the market, will lead to product market change, and this will enable many consumers to easily select energy-efficient products and raise the economic welfare level (Wiel, S., McMahon, J.E., 2005). Thus governments in the world are now recommending an energy efficiency standard and product labeling. China in 2005 and India in 2006 introduced energy efficiency labeling programs for energy-efficient home electrical appliances as a part of their energy efficiency measures. Thailand had already adopted such a program in 1994.

The impact of such programs has been examined by measuring the energy consumption of the "business-as-usual" scenario and alternative scenarios with those involving standards and labeling (Malhia *et.al.*(2004), World Bank(2006), Zhou *et. al.*(2011)). Willingness to pay for energy efficient products has also been estimated by contingent choice experiments (Banfi *et.al.*(2008), Ward *et.al.*(2011), Wang *et.al.*(2011)) and by hedonic approaches (Galarraga, 2011). These studies show the benefits of the standard and labeling programs and the positive response of consumers to such program. But in the actual market, however, consumer may not be well aware of the existence and meaning of standard and labeling. Based on a household survey in Germany, Mills and Schleich(2010) pointed out that knowledge of appliance energy classes is low for all appliances, ranging from 24 percent for households with a washing machines, and 16 percent for households with dishwashers.

In 2011, the Overseas Research Department of the Japan External Trade Organization(JETRO) conducted a questionnaire survey to see the present state and associated problems of energy efficiency measures and energy efficient labeling program in China, Thailand and India (Japan External Trade Organization, 2011). This article provides overviews of the results of this questionnaire survey and statistical analysis of the consumer behavior relative to the energy labeling. Section 2 includes explanation of different policy measures

on standards and labeling energy efficiency of home appliances in the three countries. Section 3 provides an overview of questionnaire survey conducted by the Overseas Department in JETRO, and data analysis is included in Section 4.

2 Energy Efficiency Standard and Labeling Program in China, Thailand and India

There are several types of standards and labeling programs on product energy efficiency. In this section, types and characteristics of standards and labeling programs are explained, to provide a view of the characteristics of the programs in China, Thailand and India.

2.1 Types of Demand Side Management Program to Penetrate Energy Efficient Products

Intervention programs to raise energy efficiency mainly consists of two factors: (1) energy efficiency standards for the product, and (2) labeling of the energy efficiency levels of the products.

2.1.1 Classification of Energy Efficient Standards

Standards, the first pillar of demand side management program, are set primarily from two different philosophies: One involves the minimum requirement which bans too many low energy efficient products from the market. The other involves setting standards on the average efficiency level standard: corporate average efficiency standards (CAFE in the United States, explained later, is an example.). The Top Runner standard (standards are set so as to induce innovation) are variants of this system. Under the average standard system, products can be listed if the average of energy efficiency of total products of the manufactures is higher than required level even though some particular products may be extremely inefficient.

Manufacturers in developing economies are usually required to comply with the "Minimum Energy Performance Standard" (MEPS). MEPS can be voluntary or mandatory. If voluntary, manufacturers can put a label on their products and satisfy the MEPS. Manufacturers can decide whether they follow MEPS and that whether or not put the mark on the products. In the mandatory case, manufacturers must follow the MEPS. They cannot sell goods which do not achieve MEPS. It is a product based requirement for manufacturers.

Table 1: 2 Types of Energy Efficiency Standards

Standards	Contents
Minimum requirement policy	
Minimum Energy Performance Standards (MEPS)	Set the minimum energy efficiency level such that all market products should comply.
Innovation inductive policy	
MEPS + HEPS	MEPS sets lower limits, HEPS provides innovation targets.
Average Energy Performance Standards (CAFE in US)	Weighted average energy efficiency level of all products mush be higher than reference levels. Levels are set by considering expectation of technological improvement.
Top Runner Standards(Japan)	Weighted average of the energy efficiency level of all products must be higher than the reference levels. Levels are set by considering expectation of technological improvement.

Source: Interviews and reported materials.

Importers also must follow the requirement [1]. In addition to MEPS, corporate average efficiency standard and Top Runner, the Higher Energy Performance Standard (HEPS) has been introduced in some countries presumably to induce innovation and improvement of energy efficiency level of the total market. Usually, HEPS is a voluntary standard. Products satisfying HEPS can have a certain mark put on them. Another type of requirement to manufacturers is"Corporate Average Fuel Efficiency" in the United States. This requires manufacturers to satisfy the energy efficiency levels in terms of average of all sold products. Manufacturers and importers must report the number of and the energy efficiency level of each sold item. Based on the report, the average cooperate energy efficiency level is calculated. One famous program is "Corporate Average Fuel Efficiency" in United States which applies automobile. A modification of "Cooperate Average Product Energy Efficiency" is to impose the requirement on average product energy efficiency by class of products. For example, Japan requires manufacturer and importers to satisfy a certain average energy ef-

[1]For example in India, energy efficiency standard for air-conditioner and other three products transferred from the voluntary one to the mandatory in 2010. The governments described the products in the voluntary period as being in the pipeline.

ficiency levels for several categories within items, based on types and capacity of products.

Table 2: Energy Efficiency Standards and Labeling of China, India and Thailand

	Law etc	EE Standards	Labeling
China	The Law of Energy Conservation (1998)	MEPS(2005)	Compulsory for 23 products. three to five levels of labels.
India	Energy Conservation Act(2001)	MEPS (2001) Super HEPS(2012) 5 levels of labels	Voluntary for 12 products in 2005. four products compulsory in 2010.
Thailand	Energy Conservation Promotion Act(2007)	MEPS(1995) HEPS(2007)	Voluntary for four products five levels of labels. Only the top level label can be observed in the market.

Source: Interviews and reported materials.

The second pillars of a demand side management program is a labeling program, which can also divided into mandatory or voluntary program [2]. The International Energy Star program targets relatively higher energy efficient office equipment such as computers, printers and copying machines. Products in top 25 percent in terms of energy efficiency can have the label put on them. This is a single level labeling program. The other type of labeling is multiple level labeling. A product is classified into three to seven energy efficiency levels. The reference level of labeling varies with "stars." If mandatory MEPS is implemented, the minimum of the lowest level of labeling is set to MEPS. In the case of a voluntary MEPS program, a middle level of labeling is set as MEPS. Another approach, which is implemented in Japan, is to set the reference level as "Top Runner" of energy efficiency in a given reference year. The revision of MEPS and reference level of labeling is important, in order to provide incentives for innovation by manufacturer and for selective purchase by consumers.

[2]In Thailand, labeling is voluntary programs. As a result, consumer can observe the label of 5 stars, the highest category, on the market, because manufacturers would not put the label on their products when it is classified into four stars or below.

2.1.2 Energy Saving Labeling in China

The Energy Conservation Law in China was approved in 1997 and enacted in January 1998. The state was required to make a list of backward and excessively energy-consuming products and equipment which should be phased out of the market (Article 17). The labeling program is voluntary and is referred in Article 18. The Energy Efficiency Labeling Management Regulation, which is the basis for the China Energy Label, was issued in March 2005. In the revision of the Energy Conservation Act of 2007, which was enacted in 2008, a mandatory labeling scheme (Article 18 was mentioned). There are two types of labeling for energy saving, the "Energy Conservation Certification" and the "China Energy Label". The "Energy Conservation Certification" targets the top 20% of energy efficient specific products in the market. It is a voluntary and third party certification program. Certification projects were begun in February 1999. The "China Energy Label" is put on the products according to their energy efficiency. Products are classified into three to five categories. The label was launched in March 2005. The lowest category is set above the level of MEPS. Twenty three products have been selected for mandatory labeling.

2.1.3 Energy Efficiency Standards for Labeling Thailand

The Energy Conservation Act was developed in 1992 in Thailand. The government was required to specify high energy efficiency equipment. The Energy Conservation Act revised in 2007 made government set industrial standards on energy efficiency of products mandatory. The "Energy Efficiency Label" was started in September 1994. As of September 2011, 15 products have been covered. It is a voluntary program. The label provides information on the level of energy efficiency in five levels, product categories, average electricity consumption, and expected electricity fee. MEPS has been also established for room air conditioners and refrigerators on a mandatory basis, and for tube fluorescent lamps, light bulbs with ballast and compacted fluorescent lamps on voluntary basis.

2.1.4 Energy Efficiency Standard in India

The Energy Conservation Act was enacted in 2001 in India. Based on this act, the Bureau of Energy Efficiency was established. The bureau has the authority to prohibit production, import and sales of products not satisfying the energy efficiency standard and to conduct

a labeling program. "Standard & Labeling Program" in India was started in May 2006. As of September 2011, the number of products covered by labeling program reaches 12 products. January 2010, energy efficiency labeling has become compulsory to refrigerators, air conditioners, tube fluorescent lamps and "z" transformers.

3 Environmental Consciousness and Purchasing behavior in China, India, Thailand

Whether or not demand side management works efficiently depends on preference and constraints of consumers. To grasp the nature of consumer demand, JETRO carried out a survey in China, India and Thailand in 2010 on perception of product choice and determinants of the choice.

3.1 Profile of the Survey

The Survey was conducted by distributing questionnaires to sampled households in Beijing and the rural area within 40 km of Beijing (electrified households) in China, in Bangkok and the rural area within 80 - 130 km of Bangkok (electrified households) in Thailand and in the Delhi and the rural area within 40 - 80 km of Delhi (electrified households) in India from December 2010 to January 2011. There were 783 responses. General households were quantitatively surveyed to understand the present state of energy efficiency consciousness and purchase behavior of consumers in the target countries. The survey was conducted to grasp the present state of energy efficiency labeling program in China, Thailand and India as reference for surveys of literature and interviews with the organizations implementing energy efficiency labeling programs of the government and other bodies in target countries. Validation following quantitative analysis through totaling and correlation analysis of the field survey by questionnaire is presented below.

3.1.1 Recognition of Energy Efficiency Label

Recognition of energy efficiency labels is substantially high in Thailand and India, but not so much in China. Taking those who reply, "I know well and I am able to explain about the label in detail" and "I know well, but I am not able to explain about the label in detail" as those who know the label, there were more people who knew about the label in Thailand

(76.4%) than compared with in India (55.5%) or China (33.2%). At the same time, labeling is an important determinants of decision of products choice. This is because choosing energy efficient products allows households to save on energy expenditure. Such tendency is the strongest in Thailand. Thailand consumers widely recognized energy efficiency labels (76.4%), which is an important determinant of product choice(90.0%). India followed Thailand with 55.3% of consumer in India recognizing labels but only 32.5% of them following the label's indication. According to experts interviewed in Delhi in September 2011, this phenomenon may be due to income constraints; Though Indian consumers are aware of labels and their meaning, they cannot afford choice in appliances because many products are simply expensive for them. Table 3 summarizes the data.

Table 3: Recognition and Choice

	Highly recognize labels	Label determines purchase	Label can save electricity fee.
China	33.2%	48.4%	55.5%
India	55.3%	32.5%	91.9%
Thailand	76.4%	90.0%	91.8%

Source: Interviews and reported materials.

3.1.2 Channel to Recognize Energy Efficiency Label

Considering replies by those who know about the energy efficiency labels regarding the recognition channel (the information source from which they knew about the label), in China "Salesperson inside store" was the most, then followed "TV program" and "At the store front". In Thailand "TV commercial" was mentioned the most, then followed by "TV program" and "Product brochures." In India "TV commercial" was the most, then followed "TV program" and "Salesperson inside store". In China, consumers recognized the label "At store front", while in Thailand and India many consumers recognized the label via mass media. Table 4 shows the distribution of recognition channel. In Thailand and India, TV programs and advertisement shows stronger impact on recognition, but TV's impact is limited in China.

Table 4: Recognition Channel of Energy Efficiency Label

	China		India		Thailand	
	Obs.	%	Obs.	%	Obs.	%
Sales staff	70	84.3%	49	31.2%	101	52.9%
On the shop	33	39.8%	38	24.2%	127	66.5%
From friends and acquaintance	31	37.3%				
From family	22	26.5%	16	10.2%		
Internet site	22	26.5%				
TV programme	48	57.8%	65	41.4%	132	69.1%
Ad on TV			90	57.3%	147	77.0%
Ad on the shop	21	25.3%	23	14.6%	119	62.3%
Ad on newspaper			41	26.1%	103	53.9%
Ad on magazine			16	10.2%		
Ad at outside					75	39.3%
Ad on transportation/station					57	29.8%
Product catalogue	16	19.3%	41	26.1%	130	68.1%
Magazine article	12	14.5%				
Newspaper article	8	9.6%	20	12.7%	67	39.3%
Free paper article	8	9.6%				
Total	83	100%	157	100%	191	100%

Source: Interviews and reported materials.

3.1.3 Determinants of Decision on Purchasing Home Electrical Appliances

To grasp key factors for consumer purchase of particular home electrical appliances, nine features were listed by seven levels ("Very much", "Fairly", "A little", "Moderate", "Rather not", "Fairly not" and "Not at all"). For the tendency from the total of "Very much" and "Fairly" in China, "Quality/functionality/usability" and "After-the-sale service" were valued most, while "The energy efficiency label is attached on product" was valued less. In Thailand, "Quality/functionality/usability" was the most valued, followed by "The energy efficiency label is attached". In India, "Quality/functionality/usability" and "Design" were highly valued, while "The energy efficiency label is attached" was valued least. Table 5 shows the distribution of valuation factors.

Table 5: Valuation factors to buy home electric appliances

	China %	India %	Thailand %
Price	75.2%	91.5%	82.0%
Quality/Functionality/Usability	97.6%	96.8%	94.0%
Design	75.2%	94.3%	63.6%
Brand image	67.6%	88.3%	59.2%
Popularity	74.4%	86.9%	47.6%
After Service	84.4%	88.0%	80.4%
Nationality	50.0%	71.7%	50.8%
Running Cost	68.4%	87.3%	69.2%
Energy Efficiency Label	48.4%	32.5%	90%
Total Obs.	250	283	250

Source: Interviews and reported materials.

3.2 Purchase Decision by Products

In order to determine which factor encourages consumer to choose energy efficient products, we considered the relationship of consciousness to environmentally friendliness as well as valuation of labeling and products, and their choice by products. The survey asked the interviewees about purchase, ownership and determinants of purchase on 29 products. Due to the richness of this data, we can identify the relationship between environmental consciousness, economic gains and purchase decision.

3.2.1 Choice by Products

Table 6 shows the ratio of respondents who bought products examined here. It provides a measurement of popularity of the products in each country. It can be seen that the configuration of products actually purchased in the three countries is diversified. For example, ceiling fans are very popular in Thailand and India, but not in China. Lightings are purchased less by consumer in China than Thailand and India. On the other hand, air-conditioners, TVs, refrigerators, mobile phones and washing machines are popular in all three countries. This implies that products to be labeled should be selected carefully according to characteristics of each market.

We can further see whether consumers bought labeled or non-labeled products or were indifferent to the labels (Table 7). Here we can see the relative size of labeled or non-labeled

Table 6: Ratio of those who buy the products

	China	India	Thailand
FL ballast	3%	33%	52%
PC	26%	14%	69%
PC display	17%	12%	39%
TV	38%	53%	93%
Air con	40%	30%	76%
Automobile	40%	2%	56%
Ceiling fan	8%	34%	40%
Copy machine	1%	0%	12%
Electric transformer	0%	36%	16%
Electric fan	10%	5%	98%
Refrigerator	45%	48%	98%
Gas range	8%	19%	57%
Heater	8%	19%	0%
IH cooker	16%	0%	92%
Iron	3%	10%	90%
Land phone	4%	19%	64%
Lighting	2%	99%	93%
Microwave	13%	0%	61%
Mobile phone	36%	22%	93%
Printer	2%	1%	46%
Radio	1%	6%	60%
Rice cooker	14%	0%	92%
Ventilation fan	3%	1%	18%
Video player	4%	12%	87%
Washing machine	28%	35%	76%
Water boiler	16%	8%	83%
Water pump	0%	12%	36%
Water supplier	8%	20%	28%

Source: JETRO Survey.

products. This distribution is substantially diversified by products. Among commonly labeled products, air-conditioners, refrigerators, TVs and washing machines, labeled products are more frequently purchased. Electric fans and lightings in India, mobile phones in China, rice cookers in Thailand are the products that non-labeled products are preferred or bought indifferent of labels.

Table 7: Choice of labeled and non-labeled products

Product	China				India				Thailand			
	Not Bought	Bought			Not Bought	Bought			Not Bought	Bought		
		labeled	no-label	Indifferent		labeled	no-label	Indifferent		labeled	no-label	Indifferent
Obs	250				283				250			
FL ballaster	97%	2%	0%	1%	100%	0%	0%	0%	100%	0%	0%	0%
PC	74%	13%	8%	5%	100%	0%	0%	0%	100%	0%	0%	0%
PC display	82%	10%	4%	4%	100%	0%	0%	0%	100%	0%	0%	0%
TV	62%	26%	9%	3%	64%	13%	9%	14%	100%	0%	0%	0%
Air con	60%	35%	3%	1%	70%	20%	5%	5%	25%	63%	4%	7%
Automobile	90%	4%	3%	4%	100%	0%	0%	0%	100%	0%	0%	0%
Ceiling fan	100%	0%	0%	0%	73%	6%	7%	14%	100%	0%	0%	0%
Copy machine	99%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%
Elec-transformer	100%	0%	0%	0%	64%	13%	9%	14%	100%	0%	0%	0%
Electric fan	98%	2%	0%	0%	1%	7%	45%	47%	100%	0%	0%	0%
Refrigerator	55%	37%	4%	4%	52%	29%	10%	10%	5%	84%	5%	6%
Gas range	92%	4%	2%	2%	83%	2%	5%	10%	100%	0%	0%	0%
Heater	92%	6%	2%	0%	83%	2%	5%	10%	100%	0%	0%	0%
IH cooker	84%	11%	3%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Iron	97%	2%	1%	0%	100%	0%	0%	0%	100%	0%	0%	0%
Land phone	96%	1%	3%	0%	100%	0%	0%	0%	100%	0%	0%	0%
Lighting	98%	2%	0%	0%	1%	7%	45%	47%	100%	0%	0%	0%
Microwave	87%	10%	2%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Mobile phone	65%	11%	17%	7%	100%	0%	0%	0%	100%	0%	0%	0%
Printer	98%	0%	2%	0%	100%	0%	0%	0%	100%	0%	0%	0%
Radio	100%	0%	0%	0%	100%	0%	0%	0%	100%	0%	0%	0%
Rice cooker	86%	10%	3%	1%	100%	0%	0%	0%	11%	56%	14%	19%
Ventilation fan	97%	1%	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Video player	96%	2%	1%	1%	100%	0%	0%	0%	100%	0%	0%	0%
Washing machine	72%	22%	5%	1%	65%	20%	6%	9%	100%	0%	0%	0%
Water boiler	84%	13%	3%	0%	100%	0%	0%	0%	4%	73%	11%	12%
Water pump	100%	0%	0%	0%	88%	2%	5%	5%	100%	0%	0%	0%
Water supplier	92%	4%	3%	0%	100%	0%	0%	0%	100%	0%	0%	0%

Source: JETRO Survey.

Note: For India and Thailand, only information on the labeled product is reported, and the products out of labeling product is regarded as Not Bought, though this may not reflect reality.

3.2.2 Consciousness to energy saving behavior

To explain consumer decision, we were concerned with consciousness for environmental friendly behavior as well as the valuation of products and demographic factors of households. Table 8 presents an index for environmental friendly consciousness. Generally speaking, Thailand consumers are more sensitive to environmental friendly concepts: Thailand consumers more frequently "Remove plug" or "Turn off TV"s, "Set the air-conditioner's temperatures higher", or "Do not open fridge frequently". However, what interesting is "Buy energy efficient products" index are almost the same in average of three countries.

Table 8: Energy Saving Consciousness by Country

	China			India			Thailand		
	Obs	mean	s.d.	Obs	mean	s.d.	Obs	mean	s.d.
Remove plug frequently	7000	1.208	.4525	7924	1.986	.910	7000	2.128	.921
Set air-con temperature higher	7000	2.348	1.604	7924	1.544	.858	7000	1.204	.432
Set heater temperature lower	7000	2.24	1.597						
Buy energy efficient products	7000	1.364	.7743	7924	1.459	.704	7000	1.4	.663
Save water usage	7000	1.184	.4451						
Do not open fridge's door	7000	1.648	1.225	7924	1.346	.552	7000	1.132	.339
Turn off TV or radio	7000	1.612	.9703	7924	1.432	.587	7000	1.268	.461
Turn off lighting	7000	1.16	.3980	7924	1.420	.706	7000	1.344	.553
Turn off main switch of TV	7000	1.14	.3694	7924	1.353	.560	7000	1.208	.416
Do not buy disposable	7000	1.288	.5187	7924	1.233	.478	7000	1.092	.303

Source: JETRO Survey. *Note*: 1= Do every time. 2= Do sometimes. 3. Do not(sometime do) 4=Do not completely. 5= Do not know. The index is inversely proportional to environmental friendliness.

3.3 Choice by Country

What factors determine decision regarding whether or not to buy energy efficient products? Do these factor work differently among countries? Here, we take a look at the matrix of the decision and several factors, such as, consciousness to the energy efficiency label, age of household head, values of energy efficient products that can lower running costs, interests in buying energy efficient products by country. Following these descriptive statistics, the second section includes conduct probit estimation so as to evaluate the overall impacts of related factors. Table 9 provides a matrix between purchase decisions and evaluation of

product labels. The strength of importance of whether or not the products are labeled or not is indexed in descending order (an index of 1 indicates the strongest importance for the interviewees). The results shows that in China and Thailand the more individual evaluates the label highly, the more tendencies he or she may have to buy labeled products. India's data shows an unexpected results. People value the labels highly but does not buy the products. This implies that penetration of energy efficiency labels is high in India and is independent of the decision or awareness of the consumers.

Table 9: Labels vs Choice of Energy Efficient Products by Country

	Values index									
	1	2	3	4	5	6	7	8	Total	
Label is the key factor										
China										
Not buy	1,141	1,885	2,013	821	219		27	302	6,408	
	18%	29%	31%	13%	3%		0%	5%	100%	
Buy	143	238	162	12	8		1	1	565	9%
	25%	42%	29%	2%	1%		0%	0%	100%	
India										
Not buy	7,530	22	18	4	3	2			7,579	
	99%	0%	0%	0%	0%	0%			100%	
Buy	214	58	49	15	5	2	2		345	5%
	62%	17%	14%	4%	1%	1%	1%		100%	
Thailand										
Not buy	3,549	2,100	475	133	52				6,309	
	56%	33%	8%	2%	1%				100%	
Buy	435	180	60	9	6	1			691	11%
	63%	26%	9%	1%	1%	0%			100%	

Source: JETRO Survey. *Note*: 1= Take it as highly important. 2= Take it as important. 3. Indifferent 4= Do not take it as so important. 5= Do not take it seriously at all. Hence, the index is inversely proportional to how high the interviewees values the label. The underlined figure is larger than its counterpart on the Buy/Not-buy axis.

Table 10 shows a positive relationship between those who mind running costs and their tendency to buy energy efficient products. Results shows a positive correlation between the awareness of running costs and purchase decision universally among consumers in China, India and Thailand. Particularly in India, 57% of people who bought energy efficient

products were very concerned about the running cost of the appliances. On the other hand, the perception of running costs is not a big factors in determining the purchase of energy efficient products in Thailand. Data may imply that the Thai consumer may evaluates factors other than economic ones such as environmental consciousness, whereas Indian and Chinese consumers value the more economic factors of energy efficient products.

Table 10: Running Cost vs Choice of Energy Efficient Products by Country

	Values index							
	1	2	3	4	5	6	7	Total
China								
Not buy	1,525	2,765	1,181	333	522	82		6,408
	24%	43%	18%	5%	8%	1%		100%
Buy	183	287	79	3	10	2		564
	32%	51%	14%	1%	2%	0%		100%
India								
Not buy	3,583	3,013	763	22				7,579
	47%	40%	10%	0%				100%
Buy	197	123	21	4				345
	57%	36%	6%	1%				100%
Thailand								
Not buy	2,384	1,974	1,214	285	303	76	49	6,285
	38%	31%	19%	5%	5%	1%	1%	100%
Buy	276	210	130	23	33	8	7	687
	40%	31%	19%	3%	5%	1%	1%	100%

Source: JETRO Survey. *Note*: 1= Take it as highly important. 2= Take it as important. 3. Indifferent 4= Do not take it as so important. 5= Do not take it serious at all. Hence, the index is inversely proportional to how high interviewees value running cost. The underlined figure is larger than its counterpart of the Buy/Not-buy axis.

Table 11 gives a matrix of age of the household head and purchase decision. This shows a difference among countries. In India, the younger the household heads prefers energy efficient products, but in Thailand, the opposite is true. In China, the age appears to be independent of purchase decision.

Lastly, Table 12 shows a matrix between interest in energy efficient products and decision to purchase. In China and India, there is a clear positive correlation between interest

Table 11: Age vs Choice of Energy Efficient Products by Country?

	Values index								
Age	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	Total
China									
Not buy	644	936	724	920	623	997	806	784	6,434
	10%	15%	11%	14%	10%	15%	13%	12%	100%
Buy	56	100	60	60	49	95	90	56	566
	10%	18%	11%	11%	9%	17%	16%	10%	100%
India									
Not buy	1,088	1,768	1,387	1,207	557	679	514	379	7,579
	14%	23%	18%	16%	7%	9%	7%	5%	100%
Buy	60	80	69	53	31	21	18	13	345
	17%	23%	20%	15%	9%	6%	5%	4%	100%
Thailand									
Not buy	864	1,799	1,121	1,000	687	354	359	125	6,309
	14%	29%	18%	16%	11%	6%	6%	2%	100%
Buy	88	189	139	120	69	38	33	15	691
	13%	27%	20%	17%	10%	5%	5%	2%	100%

Source: JETRO Survey. *Note*: 1= Take it as highly important. 2= Take it as important. 3. Indifferent 4= Do not take it as so important. 5= Do not take it as serious at all. Hence, the index is inversely proportinal to how high the interviewees values the concept. The underlined figure is larger than its counterpart on the Buy/Not-buy axis.

in energy efficient products and tendency to buy the appliance. In Thailand, interest is completely independent of purchase decision; those who are interested in energy efficient products do not necessarily buy them, and those who are not interested in the energy efficiency also buy.

Table 12: Interest vs Choice of Energy Efficient Products by Country

	Values index					
	1	2	3	4	5	Total
China						
Not buy	4,766	1,140	360	28	140	6,434
	74%	18%	6%	0%	2%	100%
Buy	526	36	4			566
	93%	6%	1%			100%
India						
Not buy	4,669	2,553	222	28	107	7,579
	62%	34%	3%	0%	1%	100%
Buy	231	107	2	5	345	
	67%	31%	1%	0%	1%	100%
Thailand						
Not buy	4,190	1,891	99	76	53	6,309
	66%	30%	2%	1%	1%	100%
Buy	458	209	13	8	3	691
	66%	30%	2%	1%	0%	100%

Source: JETRO Survey. *Note*: 1= Take it as highly important. 2= Take it as important. 3. Indifferent 4= Do not take it as so important. 5= Do not take it serious at all. Hence, the index is inversely proportional how highly the interviewees values the concept. The underlined figure is larger than its counterpart on the Buy/Not-buy axis.

3.4 Probit Estimation

To understand what factors ultimately determine consumer decisions to buy energy efficient products, we conducted probit estimation on purchase decision (not buy, buy labeled, buy non-labeled and buy but indifferent to label). Results show that whether or not the consumer is concerned with the label is not a significant factor in determining the decision. But, what is interesting is that "Running Cost" and "Popularity" are the determinants of purchasing labeled products (-.096, t-value is 6.11). The negative value indicates positive impact on buying decision because the index is inversely proportional to strength of value. Consumer who buys non-labeled products are more concerned with non-economic/price factors such as "Design" and " Popularity". This implies more price sensitive consumers prefer buying energy efficient products.

Table 13: Choice of labeled products

	Buy labeled		Buy Non-labeled		Indifferent	
	Coef.	(z values)	Coef.	(z values)	Coef.	(z value)
Which factors you value most?						
Price	0.071	(4.66)**	0.097	(4.70)**	0.023	(1.00)
Quality	0.020	(0.83)	0.065	(2.20)*	0.075	(2.56)*
Design	0.034	(2.01)*	0.029	(1.23)	-0.045	(1.78)
Brand image	-0.038	(2.06)*	0.049	(1.99)	0.061	(2.49)*
Popularity	-0.039	(2.66)*	-0.085	(4.04)**	-0.088	(4.08)**
After service	0.073	(4.45)**	0.081	(3.73)**	0.170	(8.18)**
Nationality of brand	0.025	(1.95)	0.063	(4.02)**	0.038	(2.43)*
Running cost	-0.100	(6.33)**	-0.027	(1.27)	-0.023	(1.10)
Label	0.016	(1.06)	0.070	(3.66)**	0.05	(2.17)*
Demographic factors						
Household size	0.015	(1.83)	0.013	(1.12)	0.017	(1.61)
Household income	0.000	(5.68)**	-0.000	(1.21)	0.000	(0.15)
Age 20-24	0.142	(2.09)*	-0.120	(1.45)	-0.058	(0.67)
Age 25-29	0.146	(2.29)*	-0.066	(0.86)	-0.033	(0.40)
Age 30-34	0.140	(2.12)*	-0.125	(1.54)	-0.085	(0.99)
Age 35-39	0.081	(1.24)	-0.027	(0.35)	-0.145	(1.66)
Age 40-44	0.060	(0.84)	-0.064	(0.72)	-0.120	(1.25)
Age 45-50	0.123	(1.75)	0.018	(0.21)	-0.073	(0.80)
Age 50-54	0.142	(1.98)*	0.014	(0.16)	-0.073	(0.75)
Energy Saving Consciousness						
Remove plug	-0.018	(1.01)	-0.013	(0.57)	0.049	(2.30)*
Set air-con temperatures high	-0.039	(2.62)**	-0.074	(3.63)**	0.041	(2.06)
Buy energy efficient products	-0.077	(3.13)**	0.072	(2.88)**	-0.043	(1.55)
Do not open fridge door	-0.016	(0.76)	0.012	(0.45)	-0.056	(1.92)
Turn off TV	0.042	(2.23)**	-0.027	(1.01)	-0.023	(0.79)
Turn off lighting	-0.039	(1.36)	-0.016	(0.52)	-0.016	(0.56)
Remove TV and radio plugs	0.006	(0.17)	0.004	(0.11)	0.047	(1.28)
Do not buy disposable	-0.135	(3.46)**	0.102	(2.58)**	-0.011	(0.27)
China	-0.057	(1.23)	0.305	(4.15)**	-0.020	(0.25)
India	-0.454	(11.63)**	0.766	(12.93)**	0.682	(12.35)**
Constant	-1.212	(12.04)**	-2.962	(22.55)**	-2.645	(19.69)**
atroh21 -0.159 (5.25)**						
atroh31 -0.144 (5.07)**						
atroh32 -0.135 (4.40)**						
Number of observation	21,845					

Source: JETRO survey.

Note: * p<0.05; ** p<0.01

The younger the head of household the more preference for buying labeled products: This may be due to their awareness of environmental friendly behavior and partly because of economic conditions. The younger generation may be more constrained by income level. At the same time, results show that the higher the household income is, the more choice for labeled products. Consumers with high awareness of environmental factors appear more likely to buy labeled products. We confirmed here that the consciousness of the consumer certainly affects their behavior, and label that facilitate understanding of energy efficiency information work as instruments in consumer decision to buy energy efficient products.

4 Conclusion

In this article, we have described programs for penetration of energy efficient products including energy efficiency standards and product labeling. Among the two pillars of this program, we focus on the impact of labeling on choice behavior of consumers. Based on the rich information from the JETRO survey, we found the following: (1)Consumers in Thailand shows the highest awareness to environmentally friendly concepts, followed by India and then China. (2)Labeling appears to be a factor in choice of air-conditioners, TVs, refrigerators and washing machines, but it seems not to be a factor in choice of ceiling fans, electric fans or mobile phones. (3)Consumers with higher energy conservation perceptions will buy energy efficient products. At the same time, economic conditions also seem to substantially affect purchase behavior of consumer. (4) Consumers in China, India and Thailand are sensitive to the energy efficiency of products, mainly because it allows them to save on electricity expenditure. (5) Labeling works as an instrument to make the energy efficiency level of products visible and helps consumer in their decision to choose or not choose products.

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